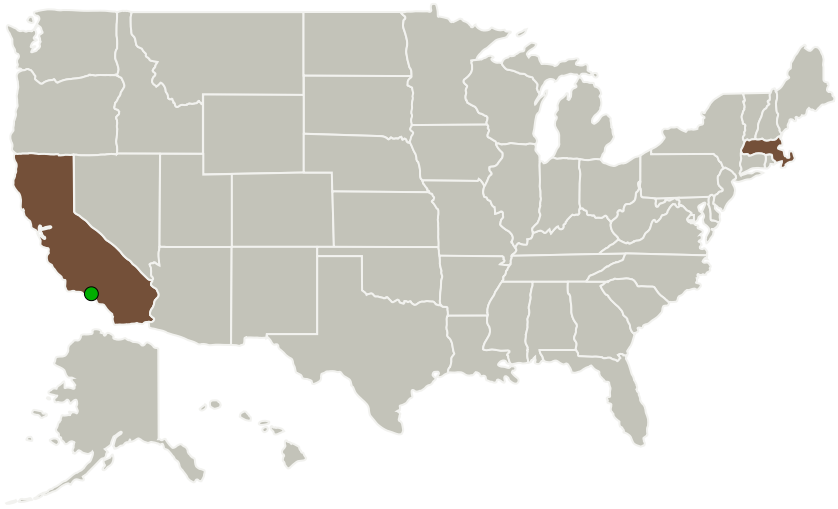
Improved Yield, Performance and Reliability of High-Actuator-Count Deformable Mirrors, Phase I

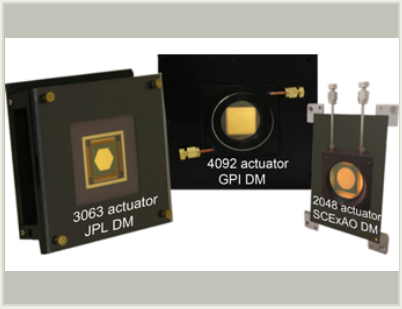
Completed Technology Project (2015 - 2015)

Project Introduction

The project team will conduct processing and design research aimed at improving yield, performance, and reliability of high-actuator-count micro-electro-mechanical deformable mirrors (MEMS DMs) that are essential for space-based coronograph instruments. The primary objectives of this Phase I proposal are to develop and demonstrate solutions to the two main problems that BMC has encountered in scaling up its DM design and manufacturing processes to array sizes of 4000 actuators or more: (1) keyhole voids occurring during manufacturing (reducing manufacturing yield) and (2) dielectric breakdown occurring during device operation (causing irreversible damage to the device). The technical approach will involve changes in DM processing technology and actuator geometry, and these will be validated in an abbreviated fabrication run at a MEMS foundry. The project goals are responsive to NASA Solicitation Topic S2.01, Proximity Glare Suppression for Astronomical Coronography, which calls for research on process technology needed to improve repeatability, yield, and performance precision of high precision DMs. Boston Micromachines Corporation (BMC) is currently a leading supplier of such DMs worldwide. If successful, this project will result in a modified process technology for DM production that eliminates manufacturing yield losses due to keyhole voids while improving DM surface quality. It will also result in a modified DM actuator design that is far less susceptible to operational damage due to dielectric breakdown, improving both reliability and lifetime.

Primary U.S. Work Locations and Key Partners





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Completed Technology Project (2015 - 2015)

Organizations Performing Work	Role	Type	Location
Boston Micromachines Corporation	Lead Organization	Industry	Cambridge, Massachusetts
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations	
California	Massachusetts

Project Transitions

June 2015: Project Start

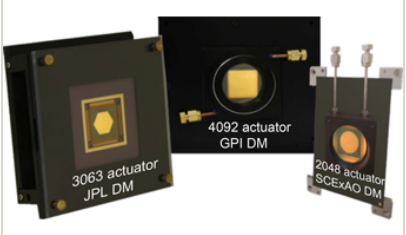
December 2015: Closed out

Closeout Summary: Improved Yield, Performance and Reliability of High-Actua tor-Count Deformable Mirrors, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image*(https://techport.nasa.gov/file/138978)*

Images



Briefing Chart Image
Improved Yield, Performance and Reliability of High-Actuator-Count Deformable Mirrors, Phase I *(https://techport.nasa.gov/image/127063)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Boston Micromachines Corporation

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

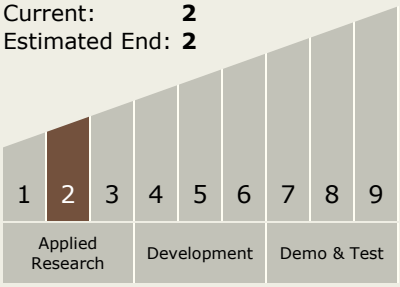
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Peter J Ryan

Technology Maturity (TRL)

Start: **2**
Current: **2**
Estimated End: **2**



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Completed Technology Project (2015 - 2015)

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.3 Optical Components

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System